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Dominion Exhibition, 1882.

with Compts of the Minister

THE MINERALS OF NOVA SCOTIA.

BY

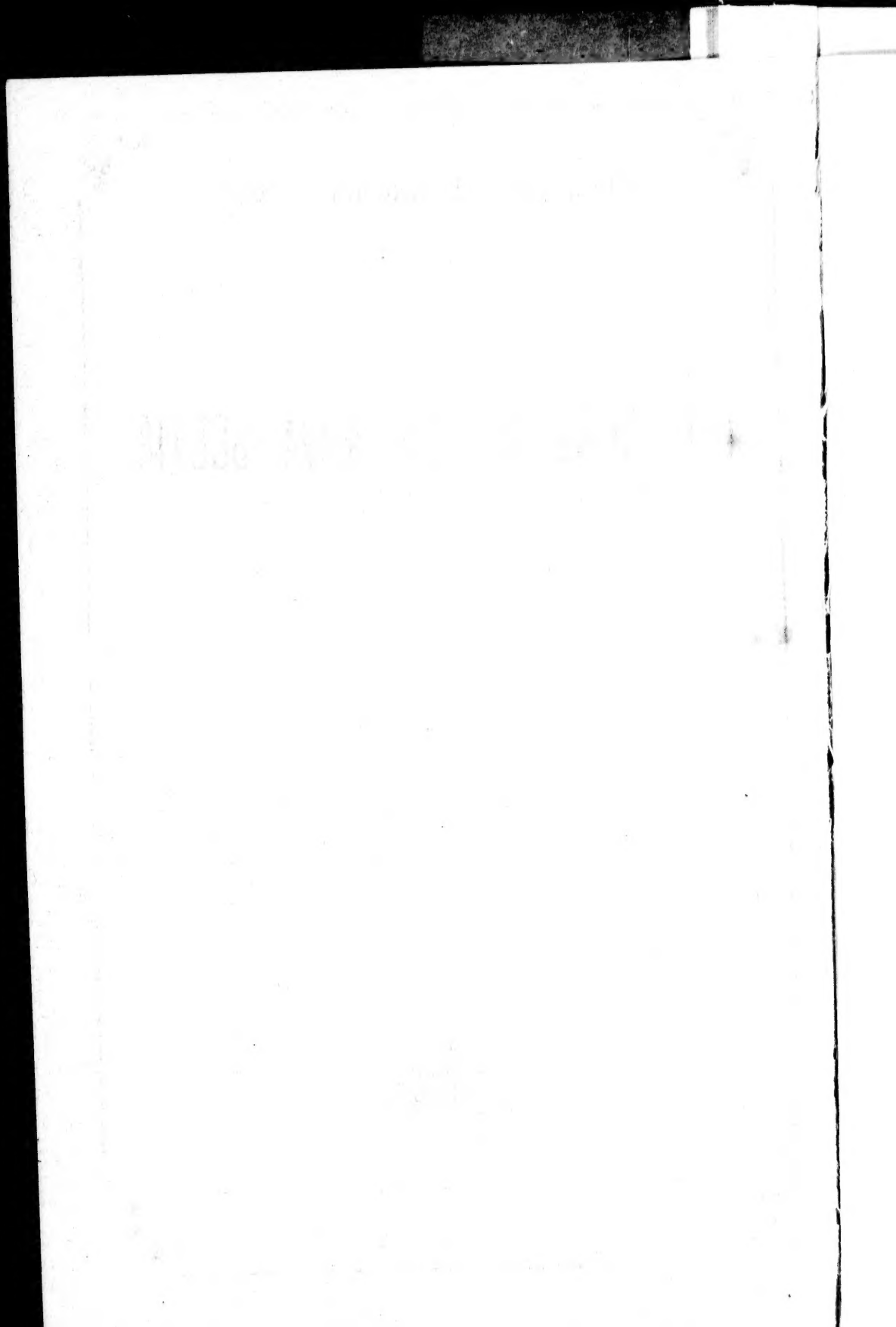
EDWIN GILPIN, JR., A.M., F.G.S., M.R.S.C.,

GOVERNMENT INSPECTOR OF MINES FOR THE PROVINCE OF NOVA SCOTIA.



HALIFAX, N. S. :
COMMISSIONER OF PUBLIC WORKS AND MINES,
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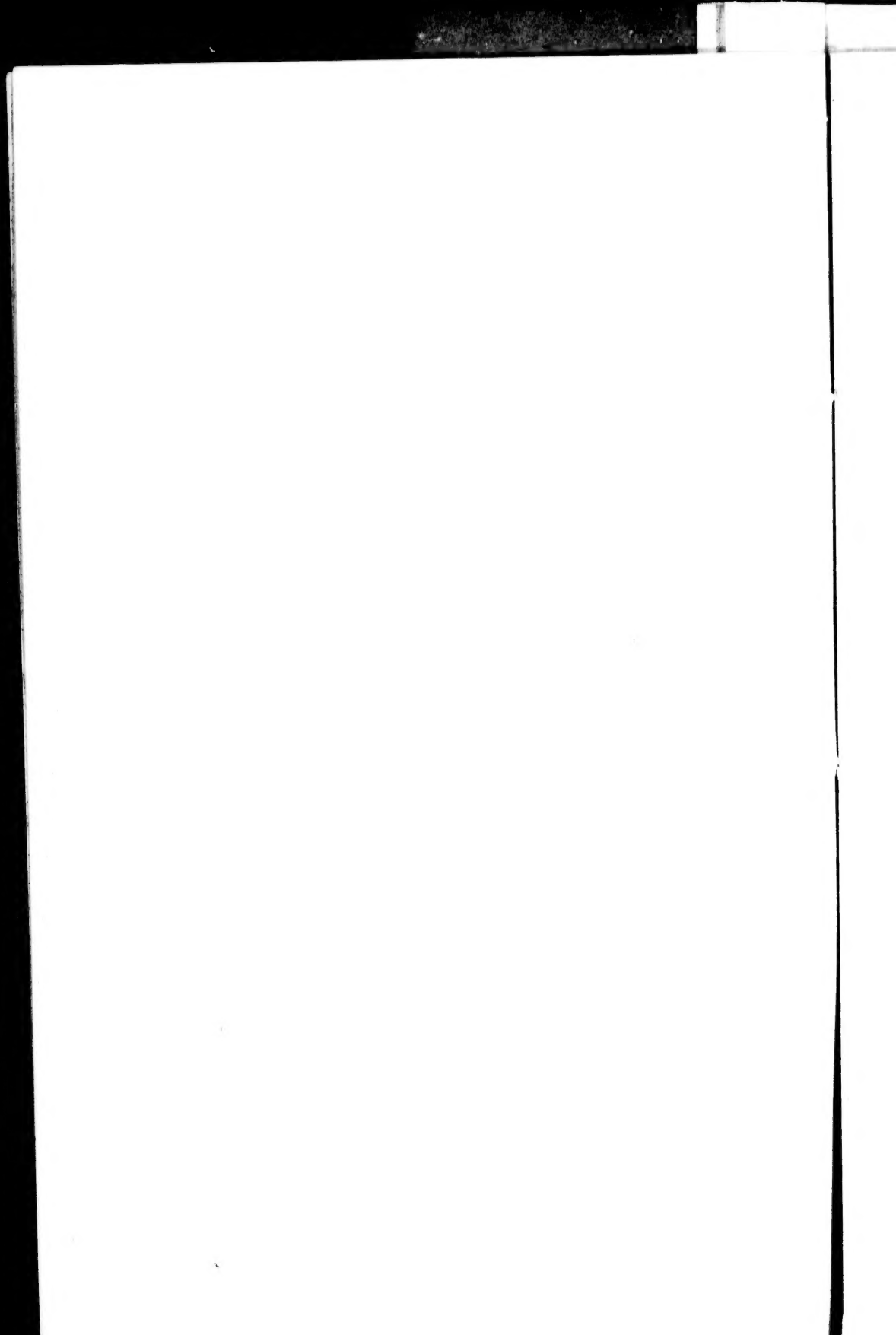
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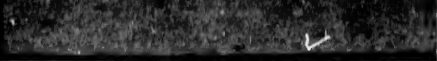
MINES OFFICE,

Halifax, September 1st, 1882.

The annexed brief notes were prepared to accompany the collection of Nova Scotia Minerals, shown at the Dominion Exhibition at Kingston, 1882.

Further information can be obtained by consulting Dr. Dawson's *Acadian Geology*; the *Mines and Mineral Lands of Nova Scotia*, by E. Gilpin; the Transactions of the Nova Scotia Institute of Natural Science, containing papers on the Geology and Mineralogy of the Province, by Dr. Honeyman and others; and on application to the Office of the Department of Mines, Halifax.

E. GILPIN, Jr.



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THE MINERALS OF NOVA SCOTIA.

The treasures of the earth are little noticed by the general public until they are undergoing the various processes of extraction and refining required to fit them for use. The erection of machinery houses, etc., and the influx of miners and labourers, are the first signs which interest people in mining, and show practically the benefits accruing to farmers, carriers, and manufacturers, who are employed in feeding and clothing the underground toilers.

The mineral resources of Canada, although great and varied, appear dwarfed by her broad boundaries, and her scattered population, engaged principally in agriculture.

In Nova Scotia alone does the miner occupy the position of a distinct class in the community. This is due primarily to its mineral wealth, which I have endeavoured to outline in the following pages, but is, perhaps, equally owing to its favoured position. Placed at the mouth of the St. Lawrence, and overhanging the eastern coast of America, its position marks it out as a halting place in the highways of the sea, and its numerous and deep harbors, permit the approach of vessels to within a few miles of every locality yielding mineral or agricultural wealth. This facility of access gave rise to an extensive exportation of coal, gypsum, grindstones, etc., to the United States many years ago, and since Confederation the trade of our mineral exportation is flowing into Quebec and other Dominion Provinces in a steadily increasing stream. The consequence of this is that our mining industries manifest a steady growth, and their future expansion will be co-equal with that of the Dominion. The natural position of Nova Scotia indicates that she should be the workshop of Canada; that here, more profitably than elsewhere in the Dominion, can sugar be refined, cotton be spun, and iron ores be smelted and worked into the thousand articles needed by the contractors

the manufacturer, and the farmer. Here alone in the Dominion are found in juxtaposition, coal, iron, fluxes, gold, etc., a boon conferred by nature on very few countries.

THE COAL FIELDS OF NOVA SCOTIA.

The first to be noticed is the *Sydney Coal Field*, on the east shore of Cape Breton. Its area of available coal is estimated at 300 square miles. It contains ten coal seams, from 3 to 12 feet in thickness, besides numerous smaller beds. The coals are highly bituminous and coking. Many of the seams yield coal well adapted for gas making; the returns of practical working show from 8,000 to 10,000 feet of gas of 15 to 16½ candle power to the ton. It is also, as appears from numerous certificates, almost equal to Welsh steam coal. Several of the seams enjoy an enviable reputation as good domestic coals, for grate and range purposes.

The following analysis will show the general character of these coals:

Moisture	1.260
Volatile combustible matter.....	35.514
Fixed carbon.....	59.111
Ash.....	4.115
Sulphur	1.300

Coal is also found at Loch Lomond, River Inhabitants, Port Hood, Mabou and other points in Cape Breton, but little attention has yet been paid to these localities.

The *Pictou Coal Field* covers an area of about 35 square miles, and is noted for the unusual development of some of the beds. There are 16 seams known, from 3 to 34 feet in thickness. The coal is not as bituminous as that from the Sydney district, but is still a coking coal, except in the case of a few seams. It is largely used at Londonderry as coke, and in the raw state for smelting iron ore. The coal has its chief reputation as a good strong steam coal, adapted for use under all forms of boilers, and is largely used on the Intercolonial, Grand Trunk and other Canadian Railways.

The following analysis will show the general character of these coals:

Moisture.....	2.10
Volatile combustible matter.....	29.20
Fixed carbon.....	61.15
Ash.....	7.55
Sulphur.....	.50

The *Cumberland Coal Field* is not yet explored over its whole extent but its area has been estimated at 300 square miles.

Operations have hitherto been confined chiefly to the Spring Hill and Joggins mines, but several new mines are being opened out.

The coal is similar in character to that of the Pictou district, and is largely used for steam and domestic purposes.

Coal is met at River John (Pictou) and several points in Cumberland and Colchester Counties, but little is known about it.

The foregoing remarks will show that there is a large supply of coal available in the Province, and that the different localities furnish the qualities required for almost every domestic and industrial use.

During the year 1881 there were 1,124,270 tons raised. This gave employment to 1,863 men, and 462 boys underground, and to 1,077 men and 165 boys above ground. The number of days' work performed was 894,961, and 327 horses were employed.

During the present year the output promises to be much larger.

The following table shows the distribution of the coal sold during the year 1881 by the Nova Scotia mines :

Nova Scotia	tons (2,240 lbs.)	382,413
Ontario and Quebec	" "	268,628
New Brunswick	" "	123,526
Newfoundland	" "	62,174
Prince Edward Island	" "	19,313
West Indies	" "	21,600
United States	" "	113,728
Other Countries	" "	13,612
Total		1,035,014

THE GOLD FIELDS OF NOVA SCOTIA.

The Atlantic shore from Canso to Yarmouth is occupied by the auriferous strata. The width of the district varies from 10 to 40 miles, and its area is estimated at 6,000 square miles. About one half of this area is occupied by granitic rocks; in the remaining 3,000 square miles are found the strata which contain gold.

Although the auriferous character of the rocks along the whole coast is well known, operations have hitherto been almost exclusively confined to the district lying east of Halifax. Here there are about 20 localities which have yielded returns for a number of years, besides hundreds of localities containing the drift of good ore, which has not yet been discovered.

The Nova Scotia gold is derived entirely from vein working. The auriferous quartz veins occur in groups, running parallel to each other and preserving fixed relations to certain lines of disturbance of the strata. They have in some cases been traced superficially for distances of over two miles, and have been followed vertically for 600 feet, without diminishing in value.

The worked veins vary in thickness from 2 to 60 inches, and are found bedded in quartzite and clay slate. Numerous sulphurets and other minerals are found in these veins, and generally hold gold.

The gold occurs in these veins principally in the shape known to miners as "coarse" gold, and is in nests and strings of every shape and size. It is sometimes found in the encasing rocks in quantities sufficient to permit of their profitable treatment.

The quartz is treated in this Province in stamp mills only, driven by water or steam power. The ore is pulverised by stamps weighing from 600 to 750 lbs. each. The gold is arrested by mercury fed into the box in which the stamping is done, and the resulting amalgam collects around the dies, etc., and is regularly removed. Copper amalgamated plates are placed outside the "battery," and over them the powdered ore is passed to deposit any fine gold not retained in the box. The cost of treating the ore in crushers driven by water power may be put down at 50 to 60 cents, and when steam power is used the cost varies from 75 cents to \$1.50, per ton.

As a rule these mills do not extract above 75 per cent. of the gold contained in the ore. Part of it passes off as an impalpable powder, and much of the loss is due to the gold being contained in the sulphurets alluded to above. No systematic concentration has yet been attempted of the tailings as they leave the crusher, but the re-working of the old heaps of tailings has been successfully commenced during the present year.

Hitherto the system of mining pursued in the Province has been of a rude and temporary character, and confined entirely to working out rich pockets in the veins. More enlightened views, however, are now entertained, and the Australian experience confirmed, that steady mining and milling of comparatively low grade ores yields more lasting and reliable returns than brief operations aiming only at the speedy exhaustion of rich pockets or "chimmies."

As yet "alluvial" gold has not figured to any extent in our returns. Although the district does not present the vast accumulations of auri

ferous soil characterising many parts of California, there can be no doubt that at many points the surface of our mining districts, and the beds of the drainage systems passing across them will be found, on proper exploration, to promise profitable returns.

The Government issues licenses to search, good for six months, and renewable. The holder can convert these licenses to search into leases, at the rate of \$2.00 an acre. These leases are for terms of 20 years, and can be renewed. The gold extracted is valued at \$18.00 per ounce for unsmelted gold, and is subject to a royalty of 2 per cent. on that valuation. The royalty is collected from the quartz mill owners, who are required to make returns under oath.

The total output since the year 1862 is estimated at 330,000 ounces. During the year 1881, there were 126,308 days' labor expended in and about the mines, producing and milling 16,556 tons of quartz, which yielded 10,756 ounces of gold, an average yield per man per day for 12 months of \$1.52. Thirty mills were employed in crushing the ore, which yielded at the rate of 12 dwts. and 20 grains per ton.

From the above it will be seen that the business, although small, pays well. The immense extent of available territory, and the favouring conditions of a healthy climate and moderately priced labour, point out the Nova Scotia gold fields as a promising territory for the legitimate exercise of the miner's art.

THE IRON ORES OF NOVA SCOTIA.

There can be little doubt that in the near future the smelting of our varied stores of iron ore will prove a most important industry in this province. Here alone in the Dominion do the ores, the fuel and the fluxes occur in that juxtaposition which is indispensable to the economical production of pig iron, and the innumerable industries directly occupied in its conversion into manufactured iron and steel.

The limits of this paper forbid my giving more than a brief list of the ores and the localities yielding them.

Beginning at the western end of the Province, we have first the Red Hematites and Magnetites of Clementsport and Nictaux, representing a range of feriferous strata, extending from Windsor to Digby, with one interruption in the shape of the Paradise granite.

These ores were worked on a small scale many years ago, but the furnaces could not compete in the limited local market against the cheap English iron. At that date they were compelled use charcoal, but the

now, with abundant railway facilities and ready access to coke, the work of smelting and exporting these ores has a much better chance of success.

Between Windsor and Truro there are numerous deposits of iron ore, one of which was worked to a small extent to supply ore to the Steel Company of Canada. The ores are brown hematites, often highly magniferous. Among the localities may be mentioned Selma, Goshen, Clifton and Brookfield.

The following analysis is of the Brookfield ore.

Water.....	11.36
Silica.....	1.54
Sulphuric acid.....	trace.
Phosphoric acid.....	trace.
Metallic iron.....	60.00

The only locality at which iron is smelted in Nova Scotia is Londonderry. Here an immense vein of ankerite, 30 to 150 feet wide, holding brown hematite, extends for many miles, and has been worked for a number of years.

The Steel Company of Canada have two blast furnaces here, and a large rolling mill and foundry. They used last year 39,588 tons of ore, and 27,831 tons of coke, besides raw coal, in smelting alone.

The pig and bar iron made here is of excellent quality, and finds a ready market.

In Pictou County workable deposits of clay-ironstone, hematite, limonite, specular and spathic ore, are found in the district extending from Arisaig on the Gulf shore to Glengarry on the Intercolonial Railway.

Some of these deposits are of unusual size, and favorably situated, as the Watson ore bed, 15 feet thick, within three miles of the Pictou coal field, the Webster bed, 20 feet thick, the Blanchard bed, 30 feet thick.

The following analyses will show their character:

	Specular.	Limonite.	Hematite.
Oxides of iron.....	92.01	93.09	70.00
" magnesia.....	2.16	1.10	—
Alumina.....	.21	—	—
Carbonate of lime.....	1.27	.91	3.03
Phosphoric acid.....	.08	—	.20
Sulphur.....	.16	.04	—
Silica.....	3.68	4.80	25.83
Metallic iron.....	64.41	62.00	15.47

Limestone suitable for flux is every where met between the coal and iron districts.

In Guysboro County several valuable deposits of specular ore have been opened and worked. The ore from one of these mines at Boylston has been satisfactorily used at Londonderry, and the Crane Iron Company of Philadelphia are working another mine at Salmon River, for exportation.

In Cape Breton valuable deposits of Brown Hematite and Magnetite are found near Lake Ainslie and Whyhogomah. Spathic ore occurs on Boularderie.

Near East Bay a valuable bed of red hematite, 6 to 12 feet wide, has been traced some distance by Mr. E. T. Moseley, of Sydney. Numerous other deposits of hematite are met at Big Pond, Loch Lomond, Grand Mira and other points in the Island.

There are very many other localities yielding iron ores, but owing to the absence of any demand for them, little search has been made. Still, enough has been done to show their variety and great abundance.

Copper.—This ore is found in this Province in rocks of every age.

The trap associated with the Trias of the Bay of Fundy yields native copper at many points, among which may be mentioned Cape D'Or, Spencer, Briar, and Five Islands. During the present season an attempt is being made to work a bed carrying copper near the entrance to Annapolis Basin. The results of the enterprise will be awaited with interest, for the presence of the metal at so many points in the trap range has raised expectations that in some localities it may be found in workable quantities.

Deposits of gray and yellow sulphurets, and carbonates of copper, are frequently met in the Upper and Lower Coal Measures of Cumberland, Colchester, and Pictou Counties. These have been worked to a small extent, and have yielded very rich ores.

At Lochaber and Polson's lake, in Antigonish County, some valuable deposits of ore have been proved. At the former place there are 6 veins, from 2 to 6 feet wide, showing ore of good quality and in quantity large enough to admit of working. Similar developments have been made at Polson's lake. These localities are about 15 miles distant from a shipping point, and have not hitherto received the attention they merit.

At Coxheath, in Cape Breton, a vigorous development is being made of a deposit carrying yellow and purple ores in felsites of Laurentian age.

So far, the shafts at depths of about 100 feet, have proved workable deposits, and arrangements are being made to build a tramway to Sydney Harbor, to allow of shipment of the richer ore, and of access to coal for concentrating the lower grades.

Gabarus, St. Ann's, and Cheticamp, may be mentioned among numerous other points in Cape Breton, where promising indications of deposits of this metal are found.

Lead and Silver.—The ore of lead most frequently met here is galena, generally carrying silver, which is said sometimes to be present in amounts running up to 100 ounces to the ton of lead. It occurs in rocks of all ages, but most abundantly in the Lower Carboniferous limestones which are met in almost every county.

At Gay's River and Pembroke, the ore is met disseminated in limestones, in quantities which have warranted a good deal of exploration. At Smithfield, in the same district, still larger deposits are met, and preparations are being made to work them. There are numerous other points yielding ore which have as yet received little attention.

Manganese.—This ore is frequently found as pyrolusite, psilomelane, and manganite, in rock of the Lower Carboniferous age. In Hants County, at Walton and Tenny Cape, the mines of J. W. Stephens, Esq., have produced considerable quantities of very fine high grade ore, bringing, I am informed, from \$110.00 to \$125.00 a ton in the United States.

Small lots of ore have also been mined from Onslow, Pembroke, and other points in Colchester County. There is little doubt that it will be extensively mined in Pictou and Antigonish Counties, since an increase in its value has directed more attention to it. Extensive deposits of the ore are found at Loch Lomond, in Cape Breton, of good grade, and readily accessible.

Gypsum or Plaster of Paris.—This mineral is found in Nova Scotia in immense quantities as soft or hydrated gypsum, and as anhydrite or hard gypsum. It occurs associated with Lower Carboniferous marls, etc., in beds frequently 100 feet in thickness. It is exposed to view in the Counties of Kings, Hants, Colchester, Cumberland, and Antigonish, and at numerous points on the Bras D'Or Lake of Cape Breton.

The chief quarries are in the vicinity of Windsor, which maintains an annual exportation of about 100,000 tons. This is shipped to the United States, the finer grades being prepared for architectural use, and the coarser ground for fertilisers.

Certain borates of lime and silica are found in the Windsor gypsum, which resemble in composition the Peruvian Borates. Should these minerals be proved here in quantity they would form a valuable article of export.

Paints.—Various beds of ochre and umber are worked to a small extent for local use, and yield shades of red, purple, etc. The localities best known are Londonderry, Chester, Onslow, Kentville, Polson's Lake, and numerous places in Cape Breton.

Barytes.—This mineral is found at numerous points in the Province, and is confined to no particular geological horizon. Little attention has yet been paid to it, and it has been worked, to a small extent only, at Five Islands and River John.

Salt.—The lower carboniferous marls and gypsums of Nova Scotia frequently yield brine springs, adapted for the manufacture of salt, but very few attempts have been made to utilize them. Among these springs may be mentioned Renfrew, Spring Hill, Antigonish, Baddeck, etc.

Mineral Springs.—These are numerous, as may be expected from the variety of our geological formations. Many of them are locally believed to exercise healing or restorative powers, and in some cases it appears justly so. Others again owe their fame merely to an abnormal taste, caused by salts not present in quantities large enough to exercise medicinal effects. Among these springs may be named those of Wilmet, Chester and Salmon and Sutherland's Rivers.

Stones for Building, etc.—The building stones of Nova Scotia are chiefly sandstone and granite. The various grades of the former are supplied almost entirely from the upper coal formation, and we therefore find the principal quarries in Cumberland County, at Wallace, Joggins, Minudie River Philip, etc., in Pictou County, at River John, the Pictou Rivers and Merigomish.

On the Basin of Minas various localities in Kings and Hants Counties yield materials adapted for building purposes.

There are numerous localities yielding syenites and porphyries, which are apparently suitable for building and ornamental purposes, although I am not aware of any practical tests. Among these localities may be named the Cobequid Mountains (Nova Scotia proper), and St. Ann's and Boisdale in Cape Breton.

Granite occurs along the Atlantic shore in every variety of texture, etc. Shelburne, Queens and Halifax Counties, have yielded handsome varieties, utilised to some extent in Halifax.

The lower carboniferous limestones have hitherto been used for little beyond lime burning, but they merit more attention for building purposes than they have hitherto received. They occur in great abundance, and present every variety of texture and composition. At some points in Cape Breton, limestones are met metamorphosed into marble, as at West and East Bays, George's River, etc., and may prove of commercial value at some localities.

Flags, slates and clays are abundant and worked for local use.

Graphite. Highly plumbaginous shales are found at many points in the Silurian strata and some of them appear rich enough to warrant a trial of their practical adaptability to the purposes for which this mineral is valued.

Infusorial Earth. Deposits of this mineral are met in many of our lakes and swamps.

Grindstones, etc. At the Joggins, Pugwash, Pudsley's, Merigomish and various points in Cape Breton, grindstones and whetstones of good quality are largely cut for local and foreign use.

The trap of the Bay of Fundy has acquired a world wide fame for the variety and beauty of its minerals. Among the more common are the varieties of the Zeolite family, but numerous other curious minerals, also derived from the infiltrating and concentrating power of water, reward the collector's labors. Partridge Island and Blomidon are among the localities which have yielded the finest specimens.

Numerous other interesting minerals occur in the Province, but the limits of this brief paper preclude any attempt to enumerate them.

The metamorphosed strata, and their accompanying igneous rocks, so abundant here, yield to the mineralogist a rich harvest for the microscope and the analyst's balance.

The readily accessible sections of our carboniferous measures have enabled our geologists to point out Nova Scotia as the typical district of this important page in the history of the past.

The work of the Canadian Geological Survey, and the labors of individuals, have shown that, valuable as our mineral wealth now appears, there are grounds for believing that in the future equally important developments may be confidently expected.

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